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10/578,784

12/19/2006

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EXAMINER

MAI, NGOCLAN THI

ART UNIT

PAPER NUMBER

1793

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DELIVERY MODE

10/15/2009

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

| | | | |
|------------------------------|--------------------------------------|-------------------------------------|--|
| Office Action Summary | Application No. 10/578,784 | Applicant(s) OMORI ET AL. | |
| | Examiner NGOCLAN T. MAI | Art Unit 1793 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
 4a) Of the above claim(s) 10-20 is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1,3-9,21,22,24-31 and 33-53 is/are rejected.
- 7) ☒ Claim(s) 2,23 and 32 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>5/9/06</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Election/Restrictions

Restriction is required under 35 U.S.C. 121 and 372.

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1.

In accordance with 37 CFR 1.499, applicant is required, in reply to this action, to elect a single invention to which the claims must be restricted.

Group I, claim(s) 1-9, 21-53, drawn to niobium powder and related product.

Group II, claim(s) 10-20, drawn to method of making niobium powder.

The inventions listed as Groups I and II do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: claim 1 is either anticipated or obvious by Tripp et al (Pat 4,957,541). Accordingly, the special technical features for the two inventions such as niobium powder comprising a niobium layer and a mixed layer of silicon nitride and niobium being present in the vicinity of the powder particle surface does not provide a contribution over the prior art, and no single general inventive concept exists. Therefore restriction is appropriate.

During a telephone conversation with applicant's agent Ms. Hui Wauters on September 4, 2009 a provisional election was made without traverse to prosecute the invention of group I, claims 1-9, 21-53. Affirmation of this election must be made by applicant in replying to this Office action. Claims 10-20 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

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Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 4-9, 21-22, 25-31, and 34-53 are rejected under 35 U.S.C. 102(e) as being anticipated by Omori et al (US 2006/0279908).

Concerning claims 1, 4-6 Omori discloses a valve acting metal for capacitor comprising niobium compound containing nitrogen and silicon, wherein silicon and nitrogen are in the form of silicon nitride. See [0094]. Omori does not disclose mixed layer of silicon nitride and niobium in the vicinity of the powder particle surfaces. However since silicon nitride presumably is present in the niobium powder it would inherently present as silicon nitride mixed with niobium in the vicinity of the powder particles surface absent of the recitation of the amount and/or the thickness the mixed layer.

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Concerning claims 21-22 Omori [0091] and [0095] teaches valve acting metal powder may be a primary powder, a secondary aggregated powder resulting from aggregation of primary powder, or a granulated powder obtained by granulating the primary.

Concerning claim 29-30 see [0121].

Concerning claims 7-9, 25-26, 27, see [0033], [0035], and [0036]

Concerning claim 27-28, see [0104].

Concerning claims 35-36, see [0139].

Concerning claims 37-38, see [0104].

Concerning claim 39, see [0102].

Concerning claim 40, see [0136].

Concerning claims 41-51, see [0142]-[0151].

Concerning claims 52-53, see [0172].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 3-5, 6, 21-22, 24, and 29-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tripp et al, hereinafter referred to as “Tripp” (U.S. Patent No. 4,957,541).

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Concerning claims 1 and 6, Tripp discloses (column 2, ll. 48-52) doping capacitor grade tantalum powder with silicon in the form of silicon compound such as silicon nitride which provides enhanced capacitance of the tantalum powder. The dopant is introduced into tantalum powder during various stages of tantalum production. Tripp teaches (column 6, ll. 3-6) the dopant can be added to other valve metal powders of capacitor grade including niobium, titanium, zirconium, and alloy thereof with each other and/or tantalum, which establishes a prima facie evidence of obviousness.

Thus, it would have been obvious to one of ordinary skill in the art to have selected niobium powder as the capacitor grade that corresponds to the claimed range. *In re Malagari*, 184 USPQ 549 (CCPA 1974). The niobium powder would inherently contain at least silicon nitride mixed with niobium in the vicinity of the powder particles surface absent of any recitation regarding the thickness of the mixed layer.

Concerning claims 21, 22, 29-31, and 41-44 Tripp teaches (column 1, ll. 53-57) the resultant capacitor grade powder having doped with silicon nitride can be agglomerated, deoxidized, sintered and anodized to form a high specific capacitance. Tripp teaches (column 1 ll. 6-8) that the capacitor grade powder is used in solid state electrolytic or wet electrolytic capacitor.

Concerning claims 3, 24 and 33, Tripp discloses that silicon is present in the amount of 50-1,000 ppm relative to the capacitor grade powder. See column 1, ll. 50-51 and claim 2. Since the content of Si is 50-1,000 ppm the content of silicon nitride therefore would be higher than 50-1,000 ppm which encompasses the claimed amount.

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Concerning claims 4-5, Si_3N_4 is taught as the silicon compound. See column 2, ll. 13-15.

Claims 1, 3-6, 8-9, 21-22, 24-26, 29-31, 33, 35-36, and 40-43 are rejected under 35 U.S.C. 103(a) as being unpatentable over He et al., hereinafter referred to as “He” (2003/0110890) in view of Tripp.

Concerning claims 1 and 6 He discloses a high surface area tantalum and/or niobium powder formed by reduction of corresponding tantalum and/or niobium oxides with metal halide. He discloses [0014] in order to obtain a high surface area tantalum and/or niobium powders as well as the sintered anodes formed from them, a dopant containing N, P, S, B or Si can be added to the starting tantalum and/or niobium oxide used during the reduction reaction, and/or added during the reaction and/or added after the reduction reaction. It would have been obvious to one skilled in the art to have selected Si as the dopant because the reference teaches the same utility over the overlapping range. Applicant is further directed to MPEP 2144.05.

He differs from the claims in that He does not specifically teach silicon nitride. Tripp discloses to enhance capacitance of a capacitor, capacitor grade powder such as Ta, Nb, Ti, Zr, and alloy thereof can be is doped with silicon, wherein silicon is added to the powder in the form of silicon nitride. Therefore to dope niobium powder of He with silicon nitride as a silicon source to improve the properties of niobium powder would have been obvious in view of Tripp. The niobium powder would inherently contain at least silicon nitride mixed with niobium in the vicinity of the powder particles surface absent of any recitation regarding the thickness of the mixed layer.

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Concerning claims 4 and 5, He in view of Tripp wherein Tripp discloses (column 2, ll. 13-15) silicon source is Si_3N_4 .

Concerning claims 8-9, He discloses [0144] and [0175] niobium powder having FSSS particle size of about $0.5\text{ }\mu\text{m}$ and BET surface area of $21.5\text{ m}^2/\text{g}$.

As for claims 21- 22 and 25 He also teaches [0022] the powder can be formed into granulated powder having medium particle size D50 of $40\text{-}300\text{ }\mu\text{m}$ and particularly $120\text{ }\mu\text{m}$ in example 6, [0188].

Concerning claim 26, He teaches [0187] granulated niobium powder having specific surface area is $4.9\text{ m}^2/\text{g}$.

Concerning claims 29-31, He in view of Tripp discloses the powder can be formed into an anode for capacitor by compacting and sintering the resultant powder [0030].

Concerning claims 3, 24, and 33, He in view of Tripp discloses the claimed invention where Tripp discloses that silicon present in the amount of $50\text{-}1,000\text{ ppm}$ relative the to the capacitor grade powder. See column 1, ll. 50-51 and claim 2. Since the content of Si is $50\text{-}1,000\text{ ppm}$ the content of silicon nitride therefore would be higher than $50\text{-}1,000\text{ ppm}$ which encompasses the claimed amount.

Concerning claims 35-36, the claimed specific surface area would inherently possess by the niobium sintered body of cited references because claimed and prior art products are identical or substantially identical in structure or composition, a prima facie case of either anticipation or obviousness has been established, In re Best, 195 USPQ 430, 433 (CCPA 1977).

Concerning claim 40, He teaches capacitance of Nb doped phosphorous is $135,000\text{ }\mu\text{FV/g}$ and $126,500\text{ }\mu\text{FV/g}$ in Examples 5 and 6 (Table 7). Similarly amount would be expected

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if Nb is doped with Si since He teaches the same improvement would be expected over the entire dopant (N, P, S, B or Si).

Concerning claim 41-43, He teaches the typical arrangement of capacitor comprising a sintered porous body as one electrode, a dielectric oxide thin film on the surface of the porous electrode and a cathode material coated on the dielectric oxide thin film. See [0002]. The forming of dielectric oxide thin film by anodization the surface of the porous electrode of niobium containing silicon nitride would inherently result in dielectric material containing niobium oxide and silicon nitride.

Claims 44-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over He and Tripp as applied to claim 41 above, and further in view of Omori et al. (US 2002/0064476).

He in view of Tripp does not teach counter electrode comprising limitations as recited in the instant claims 44-51 and electronic circuit or devices recited in claims 52-53. Omori teaches capacitor comprising counter electrode having the limitations as recited in the claims. See [0211], [0213]-[0217], [0220], [0229]. Omori also teaches [0011] the capacitor is used in electronic circuit and in electronic instruments (devices). It would have been obvious to one skilled in the art at the time the invention was made to use counter electrode of He in view of Tripp having properties that are conventionally known and taught by Omori et al. Using capacitor taught by He in view of Tripp in electronic circuit and device would also be obvious in view of Omori et al.

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Claims 1, 3-9, 21-22, 24-31, 33, 37-38, and 40-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over Omori et al. (US 2003/0170169) in view of Tripp et al.

Concerning claims 1, 6-9, Omori discloses [0114]-[0115] niobium powder for capacitor containing other elements in an amount of 50-500,000 ppm having average particle size of 0.01-10 μm , BET specific surface area from 0.5 to 40 m^2/g [0029] and a plurality of pore diameter peak tops in the pore distribution [0031]. Omori teaches [0024] the other elements are selected from the group consisting of Mg, Ca, Sr, Ba, Sc, Y, La, Ce, Pr, Nd, Sa, Eu, Gd, Tb, Dy, Ho, Er, Tm, Yb, Lu, Ti, Zr, Hf, V, Ta, Mo, W, Mn, Re, Ru, Os, Rh, Ir, Pd, Pt, Au, Zn, Cd, Hg, B, Al, Ga, In, Tl, C, Si, Ge, Sn, Pb, N, P, As, Sb, Bi, S, Se and Te. Omori does not specifically teach Si as the other element and that Si is in the form of silicon nitride. However, it would have been obvious to one skilled in the art to have selected Si as the dopant because the reference teaches the same utility over the overlapping range. Applicant is further directed to MPEP 2144.05.

Omori differs from the claims in that Omori does not specifically teach silicon nitride. Tripp discloses to enhance capacitance of a capacitor, capacitor grade powder such as Ta, Nb, Ti, Zr, and alloy thereof can be is doped with silicon, wherein silicon is added to the powder in the form of silicon nitride. Therefore to dope niobium powder of Omori with silicon nitride as a silicon source to improve the properties of niobium powder would have been obvious in view of Tripp. The niobium powder would inherently contain at least silicon nitride mixed with niobium in the vicinity of the powder particles surface absent of any recitation regarding the thickness of the mixed layer.

Concerning claim 21-22 and 25 , Omori teaches the niobium powder can be formed into granulated powder having the claimed particle size. See [0145] and [0221].

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Concerning claims 29-31 the niobium powder is then formed into sintered body for forming anode of a capacitor. See abstract.

Concerning claims 3, 24, and 33, Omori discloses the other metal is present in the amount of 50-200,000 ppm. See abstract.

Concerning claims 26-28 and 37-38, Omori discloses the claimed specific surface area, pore diameter distribution and pore diameter. See abstract. Concerning claims 35-36 Omori's sintered niobium body would inherently have the claimed specific surface area since it is formed of granulated powder having the claimed particle size and surface area.

Concerning claims 4 and 5, Omori in view of Tripp wherein Tripp discloses (column 2, ll. 13-15) silicon source is Si_3N_4 .

Concerning claim 39, Omori discloses the claimed limitation. [0128].

Concerning claim 40, Omori discloses [0042] capacitance of 40,000 to 200,000 $\mu\text{FV/g}$.

Concerning claim 41, Omori discloses capacitor comprising niobium sintered body as one electrode, a counter electrode and a dielectric material intervening between the electrodes. See [0043]. The presence of silicon nitride in the sintered body would inherently result in dielectric formed therein having mainly niobium pentoxide and silicon nitride. See [0044].

Concerning claims 52-53, Omori teaches the capacitor is for used in electronic circuit and devices and having characteristic as recited in claims 44-51. See [0045]-[0054].

Claims 2, 23, and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to NGOCLAN T. MAI whose telephone number is (571)272-1246. The examiner can normally be reached on 8:30-5:00 PM Monday-Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King can be reached on (571) 272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Roy King/
Supervisory Patent Examiner, Art Unit
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n.m.